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REITZ AND JENS INC ST LOUIS MO

NATIONAL DAM SAFETY PROGRAM. STERGEN LAKE DAM, NO NAME 448 (MO --ETC(U)

SEP 78 H M REITZ, J J BAILEY

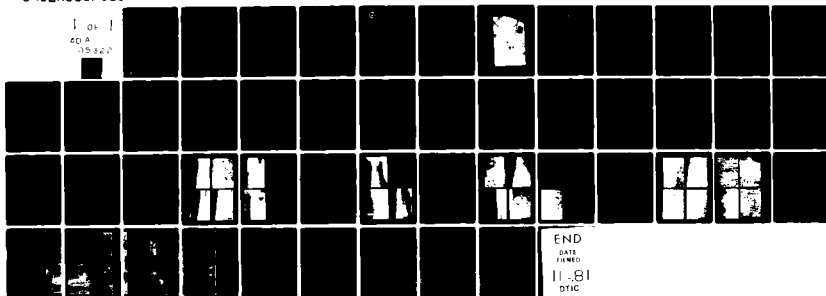
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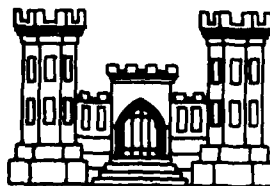
MISSOURI-KANSAS CITY BASIN

NO NAME-448

ST. CHARLES COUNTY, MISSOURI

MO 30606

**PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM**



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.		

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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: No Name 448 Dam (Mo. 30606), Phase I Inspection
Report

This report presents the results of field inspection and
evaluation of the No Name 448 Dam (Mo. 30606).

It was prepared under the National Program of Inspection
of Non-Federal Dams.

The St. Louis District has classified this dam as unsafe
and requiring prompt attention because of extensive
seepage, piping, sloughing of the downstream slope and
absence of any spillway whatsoever.

SUBMITTED BY: SIGNED 22 NOV 1978
Chief, Engineering Division Date

APPROVED BY: SIGNED 22 NOV 1978
Colonel, CE, District Engineer Date

Approved by	
Special Agent	
Inspector	
Supervisor	
Chief	
Director	
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PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	No-Name 448 Dam
State Located	Missouri
County Located	St. Charles County
Stream	Unnamed branch of Femme Osage Creek
Date of Inspection	3 September 1978 and 6 November 1978

No-Name 448 dam was inspected by an interdisciplinary team of engineers from Reitz & Jens, Inc. under contract with the St. Louis District Corp of Engineers. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as an intermediate dam with a high downstream hazard potential. The estimated damage zone from failure of the dam extends one mile downstream from the dam.

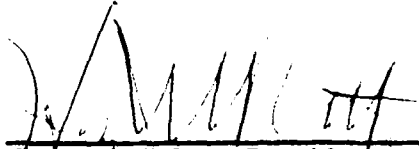
Failure would threaten the life and property of ten families and cause appreciable damage to one State highway and one county road.

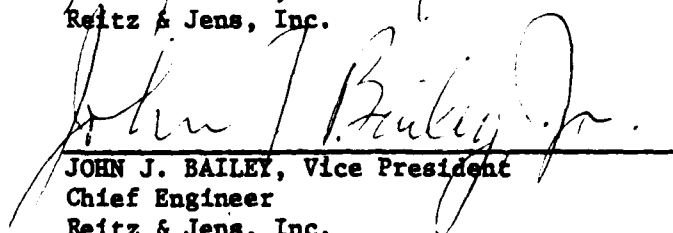
Our inspection and evaluation indicates the dam is deficient in that it has no spillway. The guidelines for a dam having the above size and hazard potential require that the spillway be capable of passing a Probable Maximum Flood (PMF). A PMF will overtop the dam to a maximum depth of 1.9 feet with a maximum flow of about 600 cubic feet per second.

The dam is also deficient in that extensive and serious seepage through and under the dam embankment is occurring and there is erosion and possible sloughing on the downstream slope.

Another deficiency was the start of tree growth on the downstream face of the dam.

While failure is not imminent, we recommend the owner take prompt action to correct or control the deficiencies described. Draining the lake until remedial measures are accomplished would be prudent. A detailed report discussing each deficiency was prepared and submitted to the Governor of Missouri and to the lake owner.


HENRY M. REITZ, President
Reitz & Jens, Inc.


JOHN J. BAILEY, Vice President
Chief Engineer
Reitz & Jens, Inc.



OVERVIEW W-MO.30606

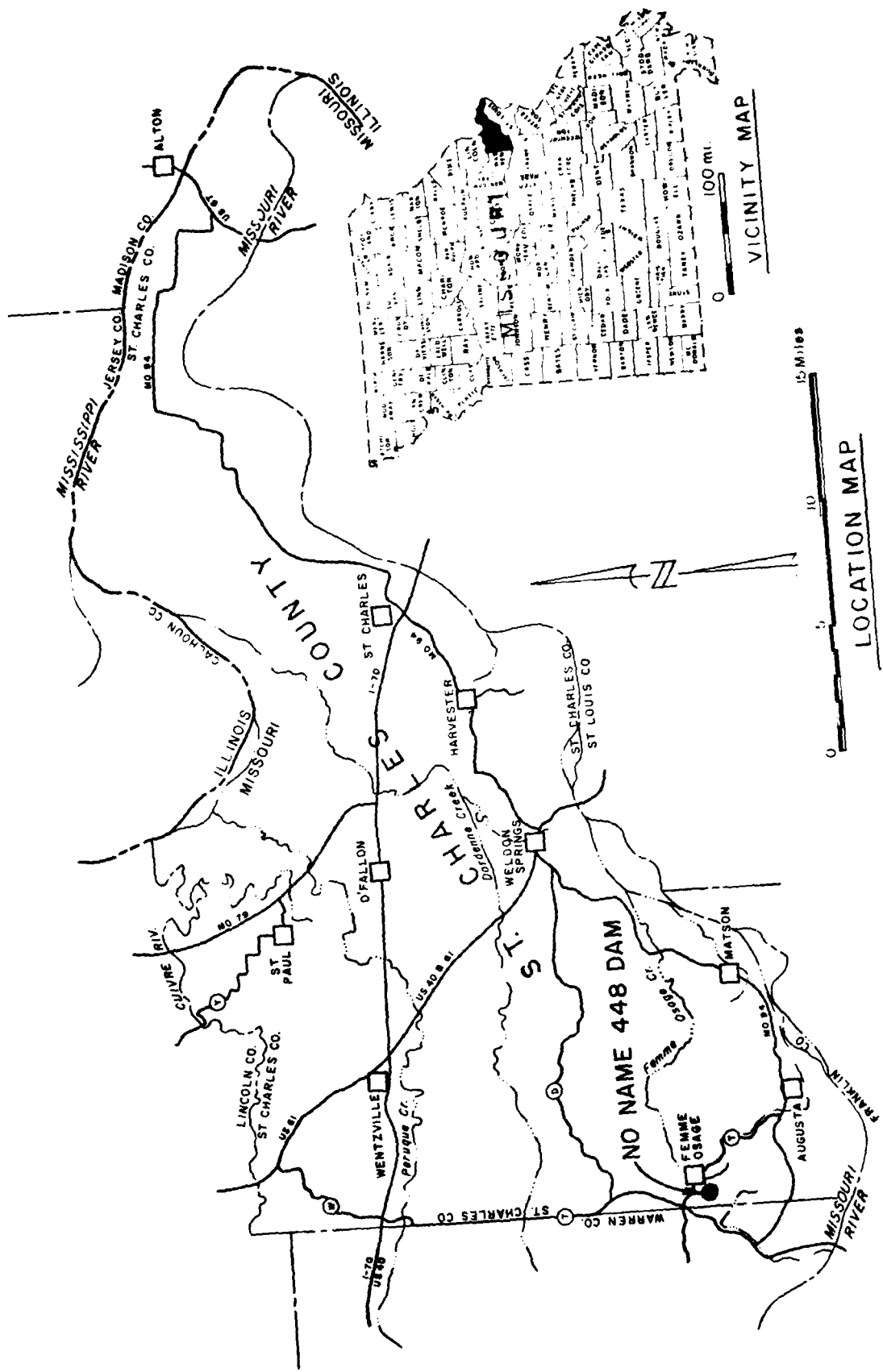


PLATE 2

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NO-NAME 448 DAM MO. ID NO. 30606

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1	Overview - Lake and Environs
2	Location and Vicinity Map
3	Plan and Profile Sheet (in pocket on back cover)
A-1 (5 sheets)	Hydrologic and Hydraulic Computations (HEC-1 Input and Output)

LIST OF INDICES AND PHOTOGRAPH NUMBERS

<u>Index No.</u>	<u>Title</u>
1	Index of Dam Photos (D-1 through D-6)
2	Index of Panorama Photos (P-1 through P-3)
3	Index of Abutment Photos (S-1 through S-5)
4	Index of Seepage Photos (SE-1 through SE-8)

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority The National Dam Inspection Act, Public Law 92-367 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer contracted with Reitz & Jens, Inc. (Contract DACW43-78-C-0162) for a safety inspection of the No-Name 448 dam.

b. Purpose of Inspection The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances The dam is an earth structure built in the hilly ground at the west edge of the floodplain of Femme Osage Creek. Topography in the watershed is rolling to steep. Soils in the greater portion of the watershed (65%) are Union Silt Loam which consists of a thin loess over a clay derived from a cherty limestone and is considered to be in Hydrologic Soil Group "C". About 10% of the watershed, at the upper north-western extent, consists of Marion Silt Loam on a very flat (1% to 3%) slopes on the narrow ridges. Marion soil is considered to be in Hydrologic Soil Group "D". About 25% of the watershed consists of steep, stony soil derived from weathering of cherty limestone. Except for small areas on the ridges in the upper reaches of the watershed which are cultivated, the entire drainage area is forested, predominantly in deciduous trees but with a sparse distribution of cedars. Highway T crosses the upper reaches of the watershed entering the eastern limits in a deep, rocky cut and then crosses the western portion on a fairly high fill.

Topography in the vicinity of the dam is shown on Plate 3.

Pertinent physical data are given in paragraph 1.3 below.

b. Location The dam is located in the westernmost extremity of St. Charles County about one-half mile southwest of the Village of Femme Osage, as shown on Plate 2. The dam and lake are located in the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 19, T45N, R1E and are shown on the Missouri, St. Charles and Warren County New Melle Quadrangle Sheet, 1972 Edition. The dam is not shown on the 1948 edition of the Augusta Quadrangle, 15-Minute Series.

c. Size Classification Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, this dam and impoundment are in the intermediate size category.

d. Hazard Classification Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph c above. Based on referenced guidelines, this dam is in the High Hazard Classification.

e. Ownership The dam is owned by Dr. N. E. Stergen, 5746 Bermuda, St. Louis, Missouri 63121.

f. Purpose of Dam The dam forms an 8-acre recreational lake.

g. Design and Construction History The inspection team was unable to find any design data on this dam. The dam was built prior to compilation of the 1972 USGS New Melle, Mo. Quadrangle Sheet which used photography taken in 1970 and after compilation of the Augusta, Mo. Quadrangle Sheet about 1948.

h. Normal Operating Procedure Normal rainfall, runoff, transpiration, evaporation and seepage either through the dam abutments or the rock in the reservoir all combine to maintain a relatively stable water surface elevation. The maximum water depth ever experienced in the reservoir is unknown.

1.3 PERTINENT DATA

a. Drainage Area - 46 acres

b. Discharge at Damsite -

(1) Discharge at the damsite is contained in the lake or lost by seepage until the dam is overtopped.

(2) Estimated experienced maximum flood at damsite - unknown.

(3) Estimated ungated spillway capacity at maximum pool elevation - none; no spillway.

c. Elevation (Feet Above M.S.L.)

(1) Top of dam - slopes 739.4 to 742.9 (see Plate 3).

(2) Spillway crest - no spillway.

(3) Streambed at centerline of dam - 695 (see Plate 3).

(4) Maximum tailwater - unknown.

d. Reservoir Length of maximum pool - 1200 feet ±.

e. Storage

(1) Top of dam - 139 acre feet

(2) Normal pool 100 acre feet

f. Reservoir Surface

- (1) Top of dam - 10.0 acres (from stage elevation data Appendix A).
- (2) Spillway crest - no spillway.

g. Dam

- (1) Type - earth embankment
- (2) Length - 500 feet.
- (3) Height - 46 feet maximum
- (4) Top width - 24 feet
- (5) Side Slopes -
 - (a) Downstream - 1V on 2.3H (determined from sections at 3+50 and 6+00 (Plate 3)).
 - (b) Upstream - Western two-thirds 1V on 2.5H to lake level. Below lake unknown. Portions of the eastern third are as steep as 1V on 1H.
- (6) Zoning - unknown
- (7) Impervious core - unknown
- (8) Cutoff - unknown
- (9) Grout curtain - unknown

h. Diversion and Regulating Tunnel - None

i. Spillway - no spillway exists.

j. Regulating Outlets - None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design data were found to be readily available.

2.2 CONSTRUCTION

No record of information concerning construction of the dam was readily available. A neighboring property owner told the inspection team that at least part of the material used for the dam embankment was waste excavation from construction of Highway "T" near dam site.

2.3 OPERATION

The maximum loading on the dam is unknown. The lake level seems to remain stable at about 4 feet below the top of dam during average precipitation of 38 inches per year. There are no records of operation of the dam.

2.4 EVALUATION

a. Availability No engineering data are available

b. Adequacy Engineering data not being available, no detailed assessment of the design, construction and operation could be made. The owner should have an engineer experienced in the design of dams perform detailed seepage and stability analysis.

c. Validity No valid engineering data on the design and construction were available.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General An initial visual inspection of the No-Name 448 dam was made on 23 August 1978. This followed two days of field measurements by a survey party on 27 and 31 July 1978. A second visual inspection was made on 6 November 1978. The training and experience of personnel in these inspections included hydrologic/hydraulic engineering, soils and materials engineering, surveying and structural engineering.

b. Dam This is an earth dam. There is a private road across the top which carries only occasional traffic. The downstream slope was measured as about 1V:2.3H. Its maximum height is 46 feet. The downstream slope was a continuous single slope (photos D-2, D-3). The slope on the reservoir side above water level appeared about as steep as the downstream slope on the western two-thirds of the dam. The exposed slope on the east third of the upstream face was as steep as 1V:1H in places (S-4, D-5).

The top of dam is essentially flat and 4 feet higher at the west end than at its low point 500 feet east (D-1, D-5). Crest width averages 24 feet. There is no special slope protection visible on the reservoir side; however, wave action against the embankment has exposed very rocky soil with coarse gravel and cobble sizes (D-4). There was heavy weed growth on the downstream face of the dam plus several saplings (D-2, D-3).

Surficial appearance of the material in the dam is consistent with the report that waste excavation from Highway T cut was used to construct the dam. As visible in both upstream and downstream dam slopes, in a nearby excavation for a building foundation on the east slope of the reservoir and in the relatively deep highway cut on County Road T to the east, available borrow material had a high rock content with soil and rock sizes ranging from the silts up to cobbles. Slopes in the borrow area showed fine grained soils over very rocky soils, some of which are cobble size. The soil profile in the borrow area, suggested by enumerated locations, had no more than 5 feet of fine grained material.

On the downstream face of the dam extensive areas with free water were observed. These areas extended from beyond the toe of the embankment to a height exceeding 20 feet above the low point of the toe. Characteristics of saturated soils, suggesting exiting of through seepage at the face of the embankment, were within about 15 feet vertically below the water surface in the pool. In this area, in the lower part, there were definite extensive areas of cattail growth, (SE-2, SE-4, SE-5, SE-6, SE-7) with isolated cattails growing at points well up the slope below the apparent phreatic surface (SE-3, SE-4, SE-8). The No-Name 448 dam has widespread through seepage. There is also underseepage along the contact between the base of the dam and the original ground surface. Although visual observation was impeded by heavy weed growth, more than a dozen shallow gullies were observed on the downstream face of the dam. These appear to be the result of the occurrence of larger quantities of seepage than were observed during the visual inspections. Several irregularities in the downstream slope were also observed. Whether these are evidence of possible sloughing or an artifact of the original construction work could not be determined because of the heavy weed growth. No visible location of piping erosion was identified. However, lack of pinpointing outwash of fines does not mean piping is not occurring and does not eliminate piping as a potential serious problem.

The steep slope on the reservoir side at the east end of the dam (S-4, D-5) suggests a localized slough at some previous time. However, considering the reported source of material for the dam, i.e. waste from highway cut, it is possible that the original placement of fill was made on this slope. No cracks in or displacement of the dam were noted.

c. Spillway No-Name 448 dam has no spillway. There is neither a primary nor an obvious emergency spillway. The eastern (lower) end of the crest of the dam is the first portion that would be overtopped (D-5, S-3, S-4). Discharge over it would be over the fill of the dam section. There was no visibly definable attempt on the eastern end (S-5) to clear or in any other way to establish a route for water that would be discharged over this portion of the dam serving as an emergency spillway. On the west end of the dam, where the crest is 4 feet higher than at the low point near the east end, there is a very shallow (S-1, S-2) suggestion of a swale that is at the contact between the end of fill and natural ground surface. Even though there were no spillways of any type, the water level behind the dam was at least 3-1/2 feet below the lowest elevation of the top of dam. No evidence of flow over the crest of the dam was observed nor was there evidence along the shore of the reservoir that lake levels had ever reached within two feet of the top of dam elevation.

d. Reservoir Except as noted in paragraph 3.1b no excessive wave-wash erosion or slides were observed along the shore of the reservoir. An island in the reservoir appears to have been constructed with waste from the highway excavation.

e. Downstream Channel As described in paragraph 3.1.c there is no spillway or channel downstream. Below the toe of the dam the natural watercourse from the drainage area crosses the Femme Osage Creek floodplain. At the fence immediately below the toe of the dam nearly all of the seepage concentrates in the bottom of this watercourse. On November 6, 1978 there was visible movement of the water in the shallow pools in this channel.

3.2 EVALUATION

The lack of a spillway or even provision for control of overtopping flow at the low point of the dam are deficiencies which, if uncorrected, could result in failure of the dam by overtopping.

It is not known whether or not an attempt was made to build a section with an impervious core. However, the seepage exiting on the downstream face and the numerous erosion channels on the face definitely indicate absence of an effectively impermeable zone in the dam.

The general area of existing through-seepage with the probability that attendant piping may be occurring or about to start, is a visible deficiency which, if uncorrected, could have a serious potential of failure of the dam.

Because of the coarser nature of the soils on the downstream slope uncontrolled growth of vegetation is not quite as serious a problem as on dams built with finer silty clays. Even so, it could result in development of a major deficiency in the future after corrections of the previously cited deficiencies.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no controlled outlet works for this dam; therefore, no regulating procedures exist. The pool is controlled by rainfall, runoff, evaporation and seepage through either the dam or the abutments or the rock around the reservoir.

4.2 MAINTENANCE OF DAM

Based on the amount of brush and size of trees on the downstream slope it has been some time since the vegetation on this slope has been cut.

No evidence was visible of any work or attempt to control or alleviate the results of seepage described in paragraph 3.1b.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

The inspection team is not aware of any existing warning system for this dam.

4.5 EVALUATION

If uncontrolled seepage on the downstream slope is allowed to continue, a serious potential for failure may develop.

If the uncontrolled growth of vegetation on the downstream slope is allowed to continue, a serious potential of failure may develop.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data No design data are readily available.

b. Experience Data The drainage area is developed from USGS New Melle, Mo. Quadrangle. Lake surface area was obtained from a 1"=200' enlargement of one of the photographs of a stereo pair taken 22 March 1977 by Surdex, Corp. at an original scale of 1"=2000'. The spillway and dam layout are from surveys made on 27 and 31 July 1978.

c. Visual Observations

(1) No spillway exists. Whenever the pool behind the dam fills discharge would start at the lowest part of the dam at the east abutment. No provisions have been made for this contingency.

(2) No drawdown facilities are available to evacuate the pool.

(3) Spillway and exit channel do not exist.

d. Overtopping Potential

(1) No spillway is available to pass the required probably maximum flood (PMF) without overtopping. The probable maximum flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The PMF will overtop the dam to a maximum depth of 1.9 feet. The depth will vary to zero part way across the dam because of the sloping crest. A width of 210 feet of dam crest will be subject to some overtopping flow. All flood flows not retained in the reservoir nor lost by seepage must be discharged over the top of the dam.

(2) The dam will be endangered by any floods occurring when the pool is full. At the current pool elevation the lake has capacity to retain a one-day 100-year flood without overtopping the dam. Assuming a start at the current pool elevation overtopping would begin to occur for a flood equal to 40% of the one-day PMF. Because there is neither pool level regulating outlet, nor a spillway, there is no assurance the pool will remain at the current elevation. In the future, it is possible that the reservoir will be full at the beginning of a period of intense rainfall. Therefore, the statements in this paragraph cannot justify the lack of a spillway but can be used to evaluate the urgency for necessary corrections.

(3) Failure of the small water impoundment on the west side of the valley above the dam, as shown on the 1972 revised USGS map would not have a significant impact on the hydrologic or hydraulic analysis.

(4) The effect from rupture of the dam could extend approximately one mile downstream of the dam. Within the damage zone are ten houses, one state highway and one county road.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations Visual observations which adversely affect the structural stability of this dam are discussed in Section 3, paragraph 3.1.b.

b. Design and Construction Data No design or construction data relating to the structural stability of the dam were found.

c. Operating Records No appurtenant structures requiring operation exist at this dam.

d. Post Construction Changes No post construction changes, other than those referenced to in paragraph a. above exist which will affect the structural stability of the dam.

e. Seismic Stability This dam is located in seismic zone 2. Considering the visible seepage and effective saturation of at least the lower portion of the section, it is possible that an earthquake shock of this magnitude could cause liquefaction and failure of the dam. The in-place void ratio of the saturated embankment material as it compares with the critical void ratio is the determining physical characteristic.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety Items noted during the visual inspection by the inspection team which should be immediately corrected or controlled were the lack of a spillway, indications of seepage of a serious amount and type through the dam embankment, underseepage along the contact between the base of the dam and the original ground surface and erosion of and possible sloughing of the downstream face of the dam. Another item was uncontrolled growth of trees on the downstream face of the dam.

b. Adequacy of Information Due to the lack of engineering design and construction data, the conclusions in this report were based on performance history and external visual conditions. The inspection team considers that these data are sufficient to support the conclusions herein.

c. Urgency The remedial measures recommended in paragraph 7.2 should be initiated immediately. If the safety deficiencies listed in paragraph 7.1.a are not corrected, there is a serious potential of failure from overtopping of the dam or failure by piping through the embankment.

d. Necessity for Phase II Based on the results of the Phase I inspection a Phase II inspection is not recommended. No further investigation is necessary to make an assessment of the dam.

e. Seismic Stability This dam is located in Seismic Zone (2). An earthquake of this magnitude may be hazardous to this dam. See paragraph 6.1.e.

7.2 REMEDIAL MEASURES

a. The dam should be removed or the owner should engage an engineer experience in the design and construction of dams to:

(1) design and supervise installation of a spillway to prevent the PMF from overtopping the dam;

(2) Investigate and determine the cause of the seepage appearing at the downstream face of the dam and then to design and supervise execution of corrective construction which may include (a) reconstruction of all or part of the embankment; (b) any other method of correcting the seepage problem that may, in the opinion of the engineer, be suitable or appropriate.

(3) Document for the record all corrective measures undertaken including as-built surveys, plans, construction tests and records, and reports of inspection during construction.

b. Seepage and Stability Analyses Seepage and stability analyses would be included in the investigation recommended in paragraph 7.2a (2).

c. O&M Maintenance and Procedures The following O&M maintenance and procedures are recommended:

(1) The owner should take immediate action to lower the lake and engage an engineer to make the investigations and designs recommended in paragraphs 7.2.a (1) & (2).

(2) After completion of the remedial measures, detailed inspections of the dam should be made periodically by an engineer experienced in the design and construction of dams.

(3) Control growth of vegetation on the dam

(4) The owner should keep a record of all future repairs, maintenance and inspections.

APPENDIX A
HYDROLOGIC COMPUTATIONS

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

1. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for a reservoir routing. The Probable Maximum Precipitation for those dams in the high hazard potential category is derived and determined from regional charts prepared by the National Weather Service and "Hydrometeorological Report No. 33". Reduction factors have not been applied. A 24-hour storm duration is assumed with the 24-hour rainfall depths distributed over 6-hour periods in accordance with procedures outlined in EM 1110-2-1411 (SPF Determination). The maximum 6-hour rainfall period is then distributed to hourly increments by the same criteria. Within-the-hour distribution is based upon NOAA Technical Memorandum NWS HYDRO-35. The non-peak 6-hour rainfall periods are distributed uniformly. All distributed values are arranged in a critical sequence by the SPF criteria. The final inflow hydrograph is produced by deduction of infiltration losses appropriate to the soil, land use and antecedent moisture conditions.

2. The reservoir routing is accomplished by using Modified Puls routing techniques wherein the flood hydrograph is routed through lake storage. Hydraulic capacity of the crest of dam is used as the outlet control in the routing. Storage in the pool area is defined by an elevation-area curve including allowance for the island in the reservoir. The hydraulic capacity of the sloping top of dam is defined by a triangular broad-crested weir equation.

3. Dam overtopping analysis has been conducted by hydrologic methods for this dam and lake. This computation determined the percentage of the PMF hydrograph that the reservoir can contain without the dam being overtopped. An output summary in the hydrologic appendix displays this information as well as other characteristics of the simulated dam overtopping.

4. The above methodology has been accomplished for this report using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. The numeric parameters estimated for this site are listed on Plate A1. Definitions of these variables are contained in the "User's Manual" for the computer program.

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 3 AUG 79

1 A ***** ID # 30606 NONAME # 448 ** ADD 635 FOR USGS ELEV*****
2 A ***** DAM SAFETY PROGRAM - U. S. CORPS OF ENGINEERS *****
3 A ***** REITZ # JENS, INC. - AUGUST 1979 *****
4 R 2RR 0 5 -0 -0 -0 -4
5 1 5
6 J 1 5 1
7 J1 0.2 0.3 0.4 0.5 1.0 1
8 K 0 1 3 1
9 I ***** INFLOW HYDROGRAPH - SCS METHOD *****
10 M 1 2 0.072 1
11 P 24.8 101 120 130
12 T
13 W2 0.17
14 X -0.10 2.0
15 K 1 04 1
16 I ***** RESERVOIR ROUTING - NO SPILLWAY - SLOPING DAM *****
17 Y 1
18 Y1 1
19 \$A 0.0 0.20 0.4A 0.90 1.56 2.70 4.22 6.56 7.89 10.34
20 \$A 11.90 13.00
21 \$E 65 67 72 75 80 95 100 105
22 \$E 10A 110
23 \$\$ 100.0 0.0 0.1 1.5
24 \$D 104.3 2.8 2.5 46.0
25 K 99

 FLOOD HYDROGRAPH PACKAGE (HFC-1)
 NAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 3 AUG 78

RUN DATE 11/08/78.
 TIME 09.34.01.

***** ID # 30606 NONAME # 448 ** ADD 635 FOR USGS ELEV*****
 ***** NAM SAFETY PROGRAM - U. S. CORPS OF ENGINEERS *****
 ***** REITZ # JENS, INC. - AUGUST 1978 *****

JOR SPECIFICATION									
NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
208	0	5	-0	-0	-0	-0	-0	-4	-0
		JOPER		NWT	LROPT	TRACE			
		5		-0	-0	-0			

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NRTO= 5 LPTIO= 1
 RTIOS= .20 .30 .40 .50 1.00

***** SUB-AREA RUNOFF COMPUTATION *****

***** INFLOW HYDROGRAPH - SCS METHOD *****									
ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO	
1	0	-0	-0	1	3	1	-0	-0	

HYDROGRAPH DATA									
INYD	IUNG	TARFA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.07	-0.00	.07	1.00	-0.000	-0	1	-0

PRECIP DATA									
SPFE	PMS	R6	R12	R24	R48	R72	R96		
-0.00	24.80	101.00	120.00	130.00	-0.00	-0.00	-0.00		

CURVE NO = -88.00 WEIRNESS = -1.00 EFFECT CN = 88.00

UNIT HYDROGRAPH DATA
 TC= -0.00 LAG= .17

RECESSION DATA
 STRIO= -0.00 ORCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 12 END OF PERIOD ORDINATES, TC= -0.00 HOURS, LAG= .17 VOL= 1.00
 50. 151. 155. 97. 49. 26. 14. 7. 4. 2.

END-OF-PERIOD FLOW									
MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD
0									

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	.00	.01	0.	1.01	12.05	145	.21	.20	.01	42.
1.01	.10	2	.01	.00	.01	0.	1.01	12.10	146	.21	.20	.01	63.
1.01	.15	3	.01	.00	.01	0.	1.01	12.15	147	.21	.20	.01	85.
1.01	.20	4	.01	.00	.01	1.	1.01	12.20	148	.21	.20	.01	98.
1.01	.25	5	.01	.00	.01	1.	1.01	12.25	149	.21	.20	.01	105.
1.01	.30	6	.01	.00	.01	1.	1.01	12.30	150	.21	.20	.01	109.
1.01	.35	7	.01	.00	.01	1.	1.01	12.35	151	.21	.20	.00	111.
1.01	.40	8	.01	.00	.01	1.	1.01	12.40	152	.21	.20	.00	112.
1.01	.45	9	.01	.00	.01	1.	1.01	12.45	153	.21	.20	.00	113.
1.01	.50	10	.01	.00	.01	1.	1.01	12.50	154	.21	.20	.00	114.
1.01	.55	11	.01	.00	.01	1.	1.01	12.55	155	.21	.20	.00	114.
1.01	1.00	12	.01	.00	.01	1.	1.01	13.00	156	.21	.20	.00	114.
1.01	1.05	13	.01	.00	.01	1.	1.01	13.05	157	.25	.25	.00	116.
1.01	1.10	14	.01	.00	.01	1.	1.01	13.10	158	.25	.25	.00	122.
1.01	1.15	15	.01	.00	.01	1.	1.01	13.15	159	.25	.25	.00	129.
1.01	1.20	16	.01	.00	.01	1.	1.01	13.20	160	.25	.25	.00	133.
1.01	1.25	17	.01	.00	.01	1.	1.01	13.25	161	.25	.25	.00	135.
1.01	1.30	18	.01	.00	.01	1.	1.01	13.30	162	.25	.25	.00	136.
1.01	1.35	19	.01	.00	.01	1.	1.01	13.35	163	.25	.25	.00	137.
1.01	1.40	20	.01	.00	.01	1.	1.01	13.40	164	.25	.25	.00	137.
1.01	1.45	21	.01	.00	.01	1.	1.01	13.45	165	.25	.25	.00	138.
1.01	1.50	22	.01	.00	.01	1.	1.01	13.50	166	.25	.25	.00	138.
1.01	1.55	23	.01	.00	.01	1.	1.01	13.55	167	.25	.25	.00	138.
1.01	2.00	24	.01	.00	.01	2.	1.01	14.00	168	.25	.25	.00	138.
1.01	2.05	25	.01	.00	.01	2.	1.01	14.05	169	.31	.31	.00	141.
1.01	2.10	26	.01	.00	.01	2.	1.01	14.10	170	.31	.31	.00	151.
1.01	2.15	27	.01	.00	.01	2.	1.01	14.15	171	.31	.31	.00	160.
1.01	2.20	28	.01	.00	.01	2.	1.01	14.20	172	.31	.31	.00	166.
1.01	2.25	29	.01	.00	.01	2.	1.01	14.25	173	.31	.31	.00	170.
1.01	2.30	30	.01	.00	.01	2.	1.01	14.30	174	.31	.31	.00	171.
1.01	2.35	31	.01	.00	.01	2.	1.01	14.35	175	.31	.31	.00	172.
1.01	2.40	32	.01	.00	.01	2.	1.01	14.40	176	.31	.31	.00	173.
1.01	2.45	33	.01	.00	.01	3.	1.01	14.45	177	.31	.31	.00	173.
1.01	2.50	34	.01	.01	.01	3.	1.01	14.50	178	.31	.31	.00	173.
1.01	2.55	35	.01	.01	.01	3.	1.01	14.55	179	.31	.31	.00	173.
1.01	3.00	36	.01	.01	.01	3.	1.01	15.00	180	.31	.31	.00	173.
1.01	3.05	37	.01	.01	.01	3.	1.01	15.05	181	.19	.19	.00	167.
1.01	3.10	38	.01	.01	.01	3.	1.01	15.10	182	.38	.38	.00	158.
1.01	3.15	39	.01	.01	.01	3.	1.01	15.15	183	.38	.38	.00	168.
1.01	3.20	40	.01	.01	.01	3.	1.01	15.20	184	.57	.57	.00	195.
1.01	3.25	41	.01	.01	.01	3.	1.01	15.25	185	.67	.66	.00	241.
1.01	3.30	42	.01	.01	.01	3.	1.01	15.30	186	1.62	1.61	.01	338.
1.01	3.35	43	.01	.01	.01	3.	1.01	15.35	187	2.67	2.66	.01	570.
1.01	3.40	44	.01	.01	.01	3.	1.01	15.40	188	1.05	1.04	.00	815.
1.01	3.45	45	.01	.01	.01	3.	1.01	15.45	189	.67	.66	.00	818.
1.01	3.50	46	.01	.01	.01	4.	1.01	15.50	190	.57	.57	.00	659.
1.01	3.55	47	.01	.01	.01	4.	1.01	15.55	191	.38	.38	.00	498.
1.01	4.00	48	.01	.01	.01	4.	1.01	16.00	192	.29	.29	.00	380.
1.01	4.05	49	.01	.01	.01	4.	1.01	16.05	193	.29	.29	.00	299.
1.01	4.10	50	.01	.01	.01	4.	1.01	16.10	194	.29	.29	.00	242.
1.01	4.15	51	.01	.01	.01	4.	1.01	16.15	195	.29	.29	.00	206.
1.01	4.20	52	.01	.01	.01	4.	1.01	16.20	196	.29	.29	.00	185.
1.01	4.25	53	.01	.01	.01	4.	1.01	16.25	197	.29	.29	.00	174.
1.01	4.30	54	.01	.01	.01	4.	1.01	16.30	198	.29	.29	.00	168.
1.01	4.35	55	.01	.01	.01	4.	1.01	16.35	199	.29	.29	.00	165.
1.01	4.40	56	.01	.01	.01	4.	1.01	16.40	200	.29	.29	.00	164.
1.01	4.45	57	.01	.01	.01	4.	1.01	16.45	201	.29	.29	.00	163.
1.01	4.50	58	.01	.01	.01	4.	1.01	16.50	202	.29	.29	.00	163.
1.01	4.55	59	.01	.01	.01	4.	1.01	16.55	203	.29	.29	.00	163.
1.01	5.00	60	.01	.01	.01	4.	1.01	17.00	204	.29	.29	.00	163.

1.01	5.00	60	.01	.01	.01	4.	1.01	17.00	204	.29	.29	.00	163.
1.01	5.05	61	.01	.01	.01	4.	1.01	17.05	205	.23	.23	.00	159.
1.01	5.10	62	.01	.01	.01	4.	1.01	17.10	206	.23	.23	.00	150.
1.01	5.15	63	.01	.01	.01	5.	1.01	17.15	207	.23	.23	.00	140.
1.01	5.20	64	.01	.01	.01	5.	1.01	17.20	208	.23	.23	.00	134.
1.01	5.25	65	.01	.01	.01	5.	1.01	17.25	209	.23	.23	.00	131.
1.01	5.30	66	.01	.01	.01	5.	1.01	17.30	210	.23	.23	.00	130.
1.01	5.35	67	.01	.01	.01	5.	1.01	17.35	211	.23	.23	.00	129.
1.01	5.40	68	.01	.01	.01	5.	1.01	17.40	212	.23	.23	.00	128.
1.01	5.45	69	.01	.01	.01	5.	1.01	17.45	213	.23	.23	.00	128.
1.01	5.50	70	.01	.01	.01	5.	1.01	17.50	214	.23	.23	.00	128.
1.01	5.55	71	.01	.01	.01	5.	1.01	17.55	215	.23	.23	.00	128.
1.01	6.00	72	.01	.01	.00	5.	1.01	18.00	216	.23	.23	.00	128.
1.01	6.05	73	.01	.01	.00	5.	1.01	18.05	217	.02	.02	.00	117.
1.01	6.10	74	.07	.04	.02	12.	1.01	18.10	218	.02	.02	.00	86.
1.01	6.15	75	.07	.05	.02	17.	1.01	18.15	219	.02	.02	.00	77.
1.01	6.20	76	.07	.05	.02	21.	1.01	18.20	220	.02	.02	.00	72.
1.01	6.25	77	.07	.05	.02	23.	1.01	18.25	221	.02	.02	.00	67.
1.01	6.30	78	.07	.05	.02	25.	1.01	18.30	222	.02	.02	.00	63.
1.01	6.35	79	.07	.05	.02	26.	1.01	18.35	223	.02	.02	.00	58.
1.01	6.40	80	.07	.05	.02	27.	1.01	18.40	224	.02	.02	.00	54.
1.01	6.45	81	.07	.05	.01	27.	1.01	18.45	225	.02	.02	.00	51.
1.01	6.50	82	.07	.05	.01	28.	1.01	18.50	226	.02	.02	.00	47.
1.01	6.55	83	.07	.05	.01	28.	1.01	18.55	227	.02	.02	.00	44.
1.01	7.00	84	.07	.05	.01	29.	1.01	19.00	228	.02	.02	.00	41.
1.01	7.05	85	.07	.05	.01	29.	1.01	19.05	229	.02	.02	.00	38.
1.01	7.10	86	.07	.05	.01	29.	1.01	19.10	230	.02	.02	.00	36.
1.01	7.15	87	.07	.05	.01	30.	1.01	19.15	231	.02	.02	.00	34.
1.01	7.20	88	.07	.06	.01	30.	1.01	19.20	232	.02	.02	.00	31.
1.01	7.25	89	.07	.06	.01	30.	1.01	19.25	233	.02	.02	.00	29.
1.01	7.30	90	.07	.06	.01	31.	1.01	19.30	234	.02	.02	.00	27.
1.01	7.35	91	.07	.06	.01	31.	1.01	19.35	235	.02	.02	.00	25.
1.01	7.40	92	.07	.06	.01	31.	1.01	19.40	236	.02	.02	.00	24.
1.01	7.45	93	.07	.06	.01	31.	1.01	19.45	237	.02	.02	.00	22.
1.01	7.50	94	.07	.06	.01	31.	1.01	19.50	238	.02	.02	.00	21.
1.01	7.55	95	.07	.06	.01	32.	1.01	19.55	239	.02	.02	.00	19.
1.01	8.00	96	.07	.06	.01	32.	1.01	20.00	240	.02	.02	.00	18.
1.01	8.05	97	.07	.06	.01	32.	1.01	20.05	241	.02	.02	.00	17.
1.01	8.10	98	.07	.06	.01	32.	1.01	20.10	242	.02	.02	.00	16.
1.01	8.15	99	.07	.06	.01	32.	1.01	20.15	243	.02	.02	.00	15.
1.01	8.20	100	.07	.06	.01	32.	1.01	20.20	244	.02	.02	.00	14.
1.01	8.25	101	.07	.06	.01	33.	1.01	20.25	245	.02	.02	.00	13.
1.01	8.30	102	.07	.06	.01	33.	1.01	20.30	246	.02	.02	.00	12.
1.01	8.35	103	.07	.06	.01	33.	1.01	20.35	247	.02	.02	.00	12.
1.01	8.40	104	.07	.06	.01	33.	1.01	20.40	248	.02	.02	.00	12.
1.01	8.45	105	.07	.06	.01	33.	1.01	20.45	249	.02	.02	.00	12.
1.01	8.50	106	.07	.06	.01	33.	1.01	20.50	250	.02	.02	.00	12.
1.01	8.55	107	.07	.06	.01	33.	1.01	20.55	251	.02	.02	.00	12.
1.01	9.00	108	.07	.06	.01	33.	1.01	21.00	252	.02	.02	.00	12.
1.01	9.05	109	.07	.06	.00	33.	1.01	21.05	253	.02	.02	.00	12.
1.01	9.10	110	.07	.06	.00	34.	1.01	21.10	254	.02	.02	.00	12.
1.01	9.15	111	.07	.06	.00	34.	1.01	21.15	255	.02	.02	.00	12.
1.01	9.20	112	.07	.06	.00	34.	1.01	21.20	256	.02	.02	.00	12.
1.01	9.25	113	.07	.06	.00	34.	1.01	21.25	257	.02	.02	.00	12.
1.01	9.30	114	.07	.06	.00	34.	1.01	21.30	258	.02	.02	.00	12.
1.01	9.35	115	.07	.06	.00	34.	1.01	21.35	259	.02	.02	.00	12.
1.01	9.40	116	.07	.06	.00	34.	1.01	21.40	260	.02	.02	.00	12.
1.01	9.45	117	.07	.06	.00	34.	1.01	21.45	261	.02	.02	.00	12.
1.01	9.50	118	.07	.06	.00	34.	1.01	21.50	262	.02	.02	.00	12.
1.01	9.55	119	.07	.06	.00	34.	1.01	21.55	263	.02	.02	.00	12.
1.01	10.00	120	.07	.04	.00	34.	1.01	22.00	264	.02	.02	.00	12.

1.01	10.05	121	.07	.06	.00	34.	1.01	22.05	265	.02	.02	.00	12.
1.01	10.10	122	.07	.06	.00	34.	1.01	22.10	266	.02	.02	.00	12.
1.01	10.15	123	.07	.06	.00	34.	1.01	22.15	267	.02	.02	.00	12.
1.01	10.20	124	.07	.06	.00	34.	1.01	22.20	268	.02	.02	.00	12.
1.01	10.25	125	.07	.06	.00	35.	1.01	22.25	269	.02	.02	.00	12.
1.01	10.30	126	.07	.06	.00	35.	1.01	22.30	270	.02	.02	.00	12.
1.01	10.35	127	.07	.06	.00	35.	1.01	22.35	271	.02	.02	.00	12.
1.01	10.40	128	.07	.06	.00	35.	1.01	22.40	272	.02	.02	.00	12.
1.01	10.45	129	.07	.06	.00	35.	1.01	22.45	273	.02	.02	.00	12.
1.01	10.50	130	.07	.06	.00	35.	1.01	22.50	274	.02	.02	.00	12.
1.01	10.55	131	.07	.06	.00	35.	1.01	22.55	275	.02	.02	.00	12.
1.01	11.00	132	.07	.06	.00	35.	1.01	23.00	276	.02	.02	.00	12.
1.01	11.05	133	.07	.06	.00	35.	1.01	23.05	277	.02	.02	.00	12.
1.01	11.10	134	.07	.06	.00	35.	1.01	23.10	278	.02	.02	.00	12.
1.01	11.15	135	.07	.06	.00	35.	1.01	23.15	279	.02	.02	.00	12.
1.01	11.20	136	.07	.06	.00	35.	1.01	23.20	280	.02	.02	.00	12.
1.01	11.25	137	.07	.06	.00	35.	1.01	23.25	281	.02	.02	.00	12.
1.01	11.30	138	.07	.06	.00	35.	1.01	23.30	282	.02	.02	.00	12.
1.01	11.35	139	.07	.06	.00	35.	1.01	23.35	283	.02	.02	.00	12.
1.01	11.40	140	.07	.06	.00	35.	1.01	23.40	284	.02	.02	.00	12.
1.01	11.45	141	.07	.06	.00	35.	1.01	23.45	285	.02	.02	.00	12.
1.01	11.50	142	.07	.06	.00	35.	1.01	23.50	286	.02	.02	.00	12.
1.01	11.55	143	.07	.06	.00	35.	1.01	23.55	287	.02	.02	.00	12.
1.01	12.00	144	.07	.06	.00	35.	1.02	0.00	288	.02	.02	.00	12.
SUM										32.24	30.94	1.30	17808.
										(819.11	(786.11	(33.11	504.27)

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
819.	191.	62.	62.	17788.
23.	5.	2.	2.	504.
	24.66	31.92	31.92	31.92
	626.34	810.75	810.75	810.75
	95.	123.	123.	123.
	117.	151.	151.	151.

THOUS CU M

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	FLEAVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM	DURATION	TIME OF	TIME OF
	STORAGE	104.30	100.00	104.30	OVER TOP	MAX OUTFLOW	FAILURE
	OUTFLOW	139.	100.	139.	HOURS	HOURS	HOURS
		0.	0.	0.			
RATIO	MAXIMUM	MAXIMUM	MAXIMUM	MAXIMUM	DURATION	TIME OF	TIME OF
OF	RESERVOIR	DEPTH	STORAGE	OUTFLOW	OVER TOP	MAX OUTFLOW	FAILURE
PMF	W.S.ELEV	OVER DAM	AC-FT	CFS	HOURS	HOURS	HOURS
.20	105.13	.83	147.	81.	24.00	16.00	0.00
.30	105.33	1.03	149.	139.	24.00	15.92	0.00
.40	105.50	1.20	151.	203.	24.00	15.92	0.00
.50	105.64	1.34	153.	268.	24.00	15.92	0.00
1.00	106.14	1.84	154.	624.	24.00	15.83	0.00

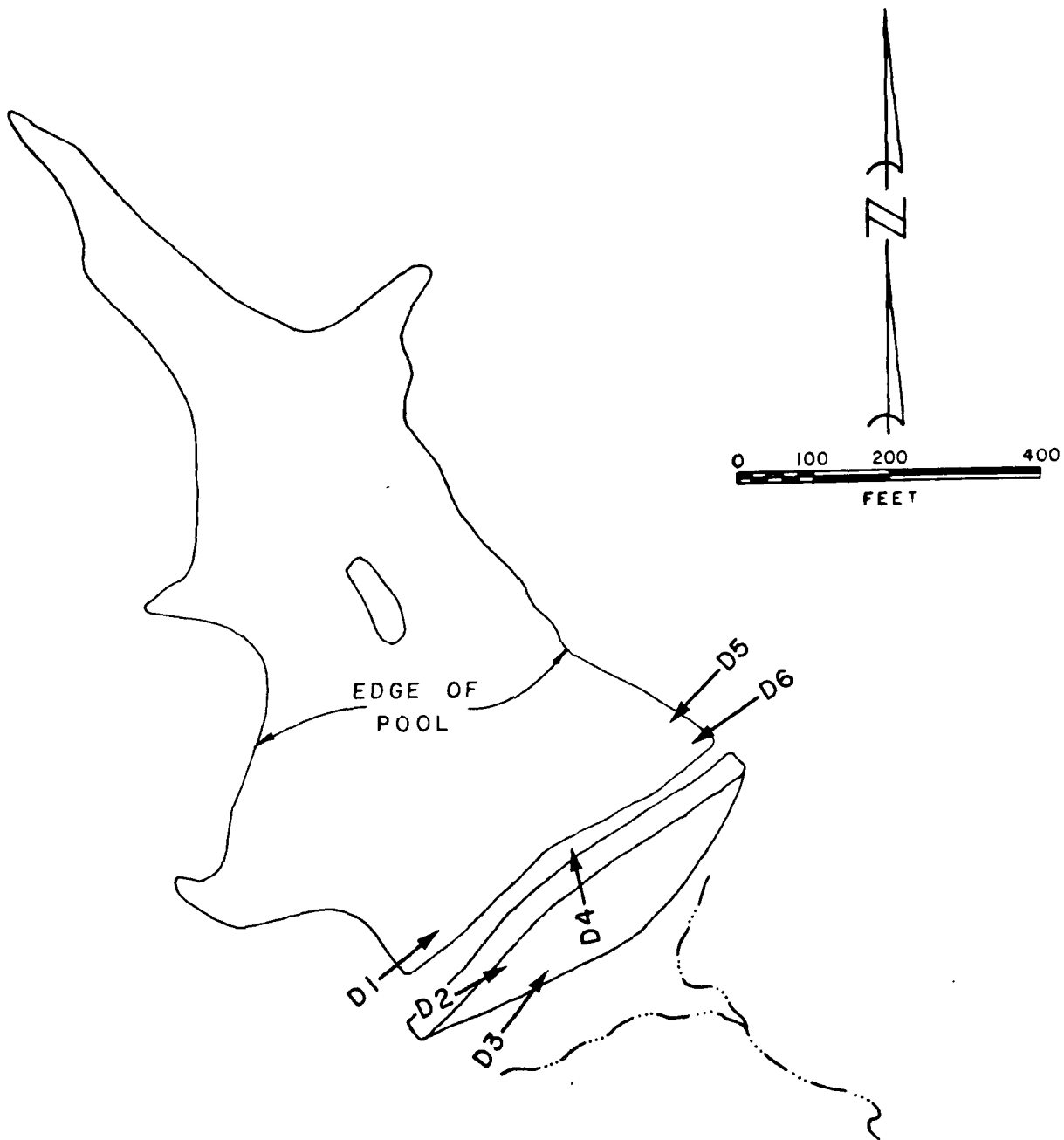


PHOTO INDEX I
FOR
DAM

NO NAME-448
ST. CHARLES COUNTY, MO.
SEPTEMBER 1978

PREPARED BY
REITZ & JENS, INC.



D3



DAM

D6



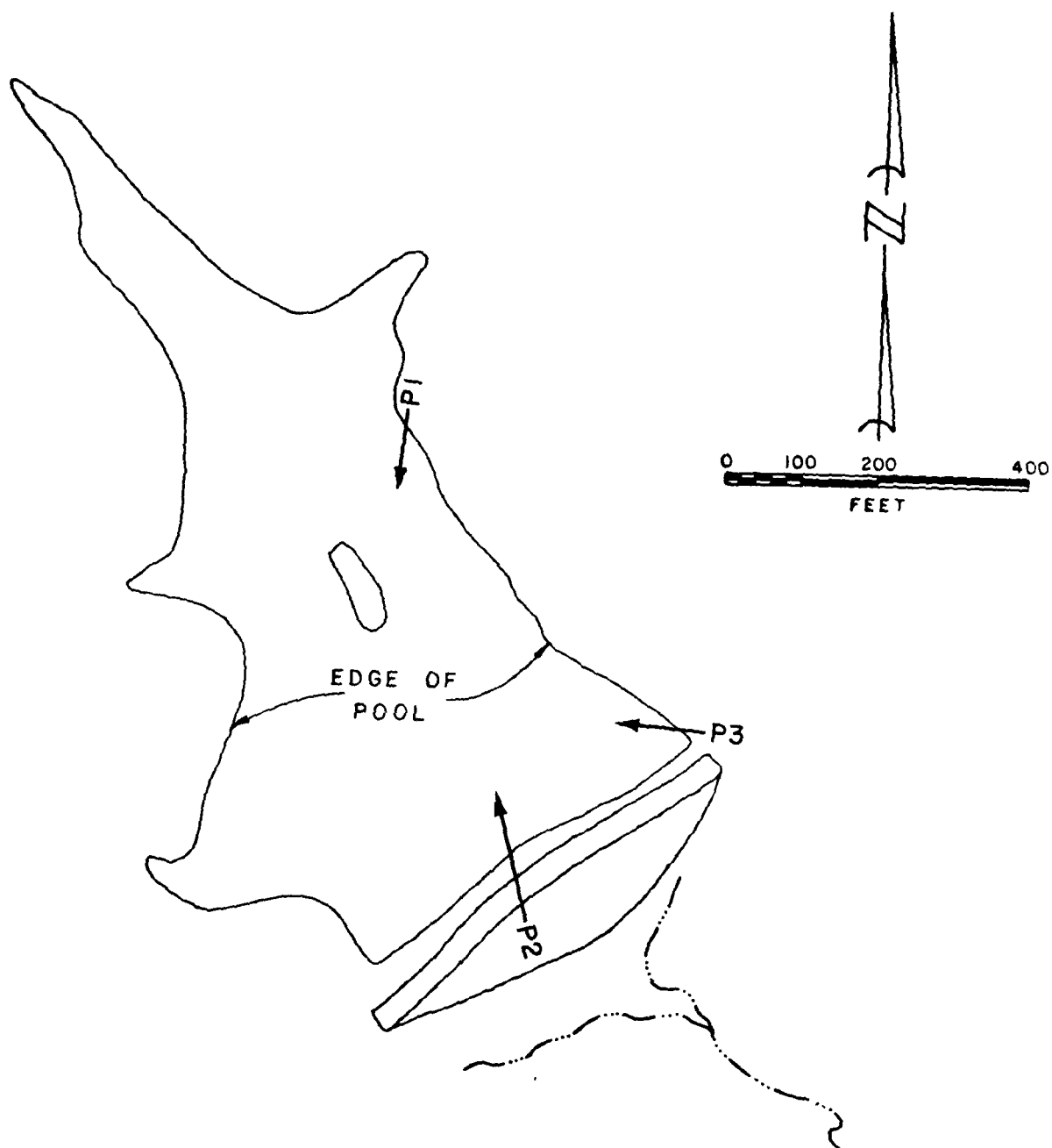


PHOTO INDEX 2
FOR
PANORAMA

NO NAME-448
ST. CHARLES COUNTY, MO.
SEPTEMBER 1978

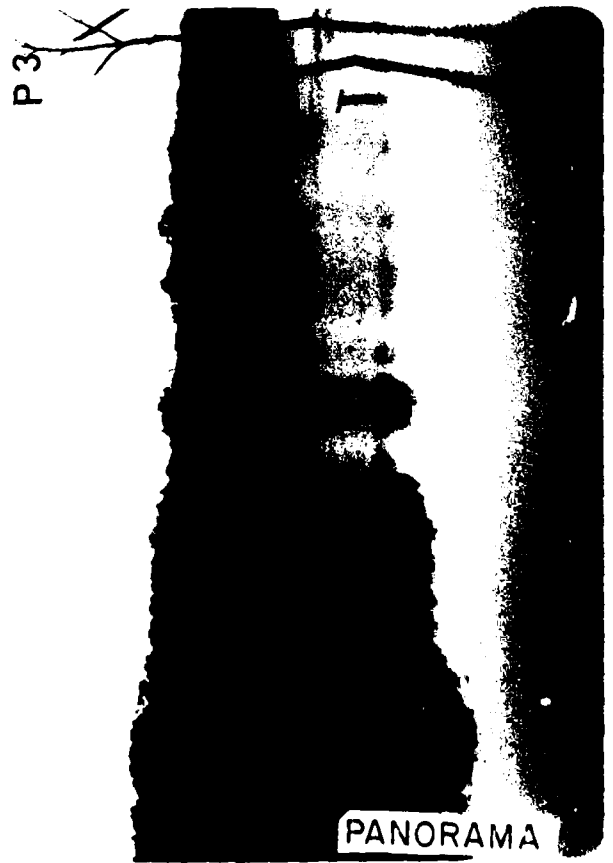
PREPARED BY
REITZ & JENS, INC.



P1



P3



PANORAMA

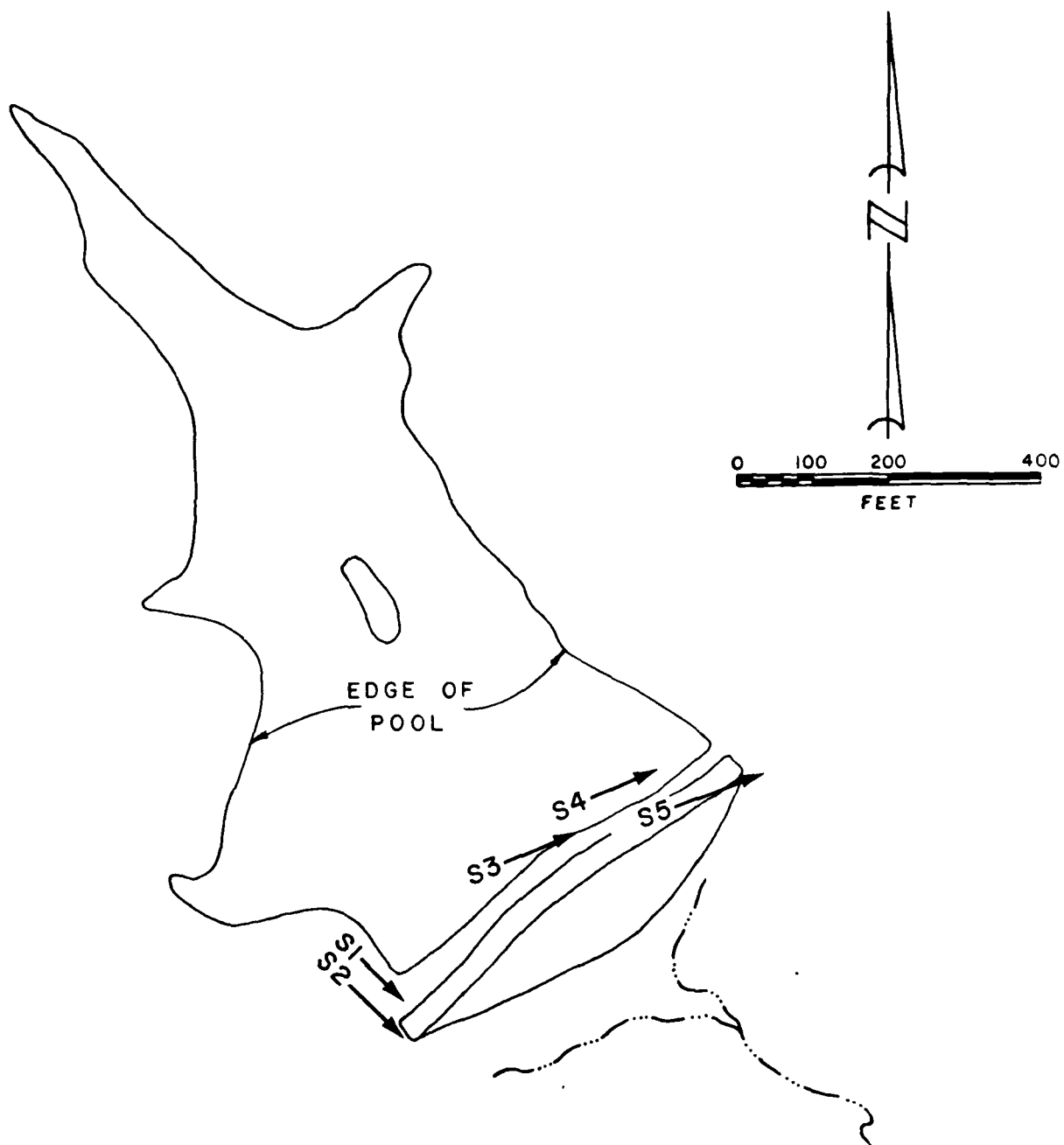


PHOTO INDEX 3
FOR
ABUTMENTS

NO NAME-448
ST. CHARLES COUNTY, MO.
SEPTEMBER 1978

PREPARED BY
REITZ & JENS, INC.

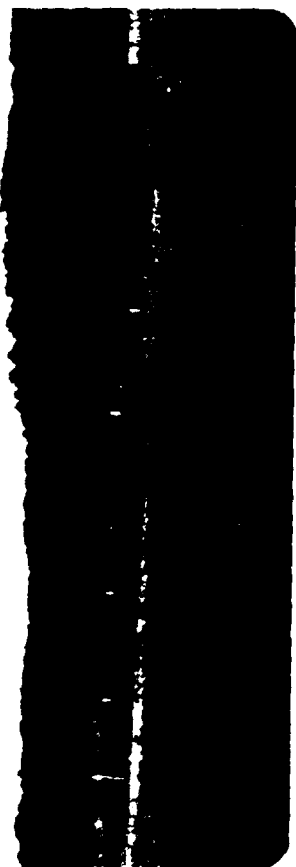


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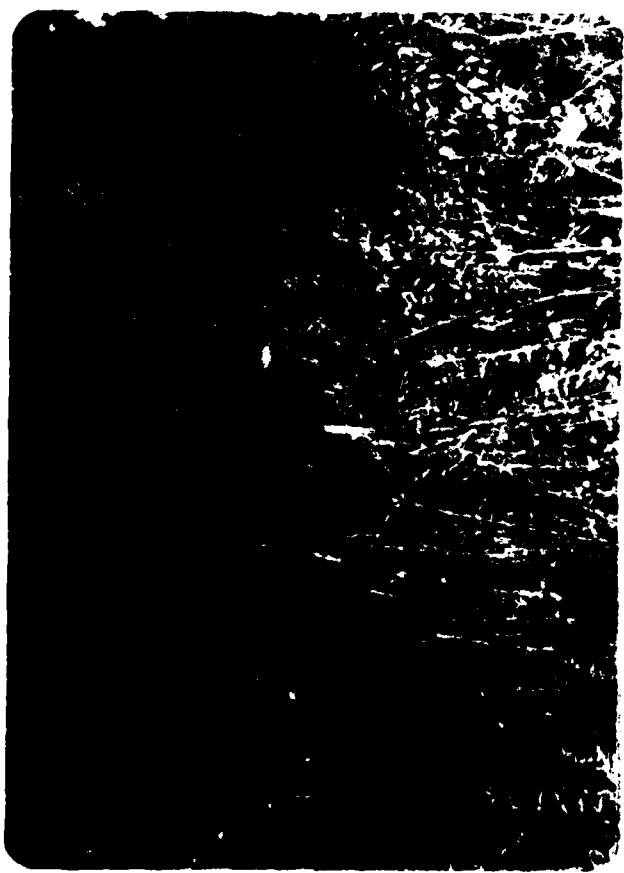


S3

S1



ABUTMENT



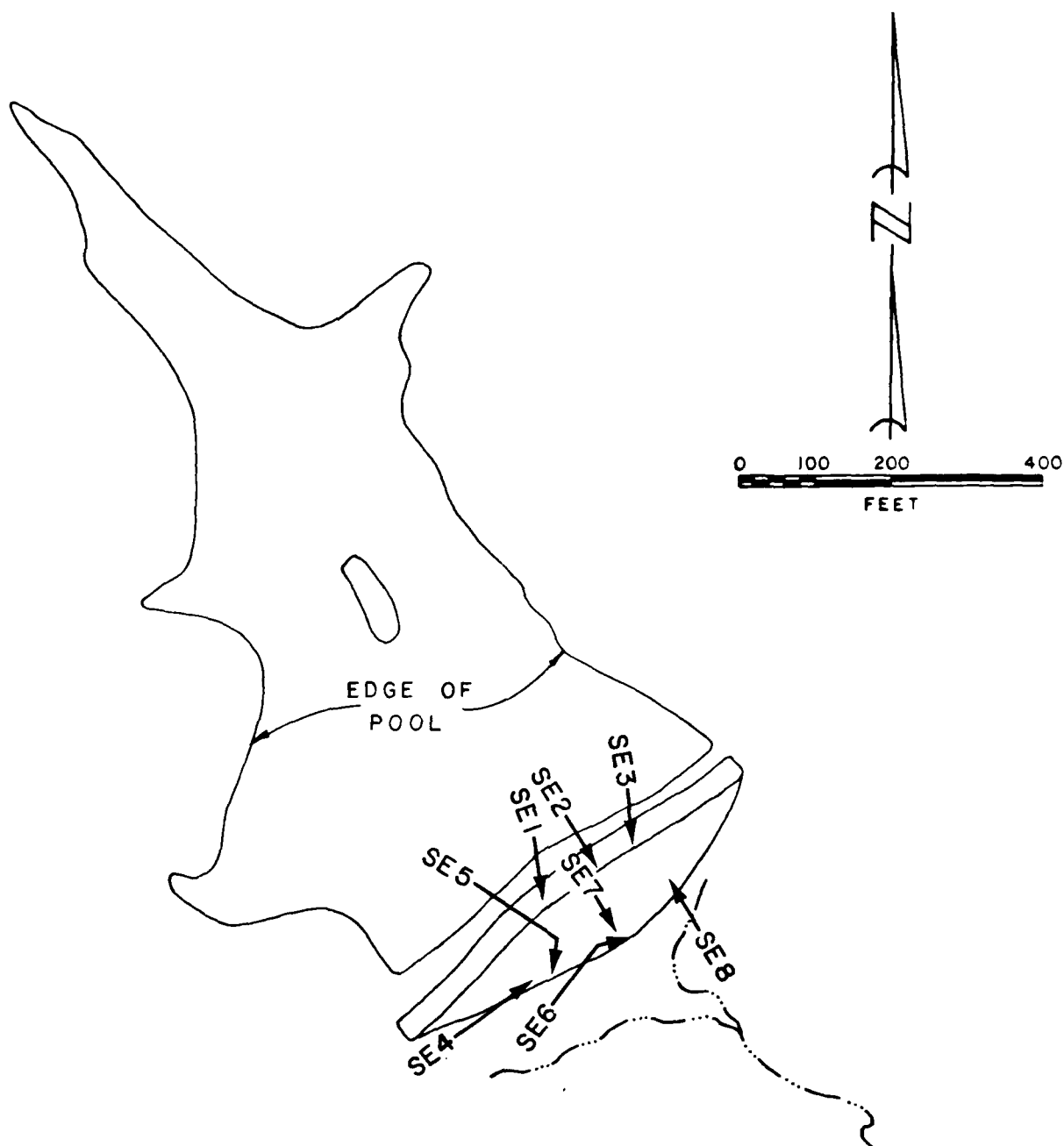


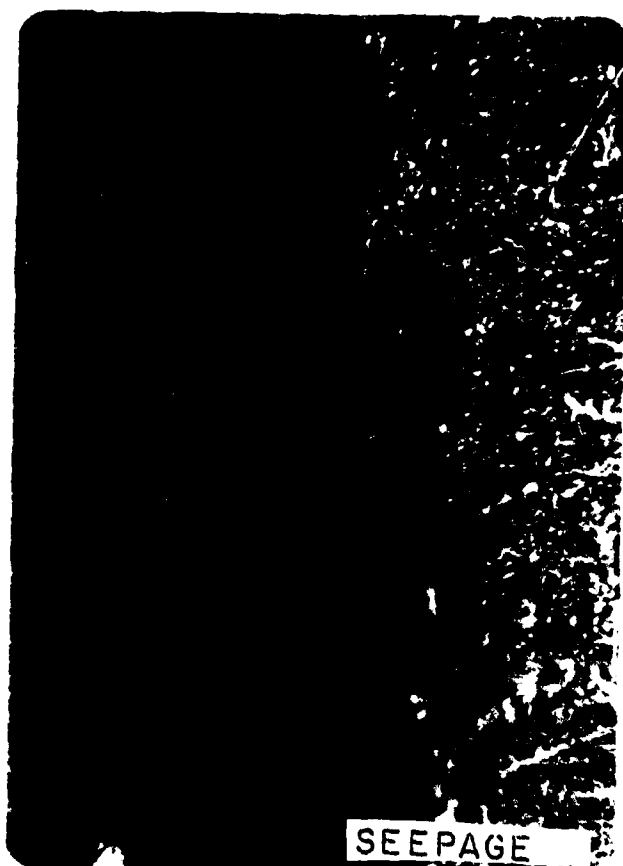
PHOTO INDEX 4
FOR
SEEPAGE

NO NAME-448
ST. CHARLES COUNTY, MO.
SEPTEMBER 1978

PREPARED BY
REITZ & JENS, INC.



SE4



SEEPAGE

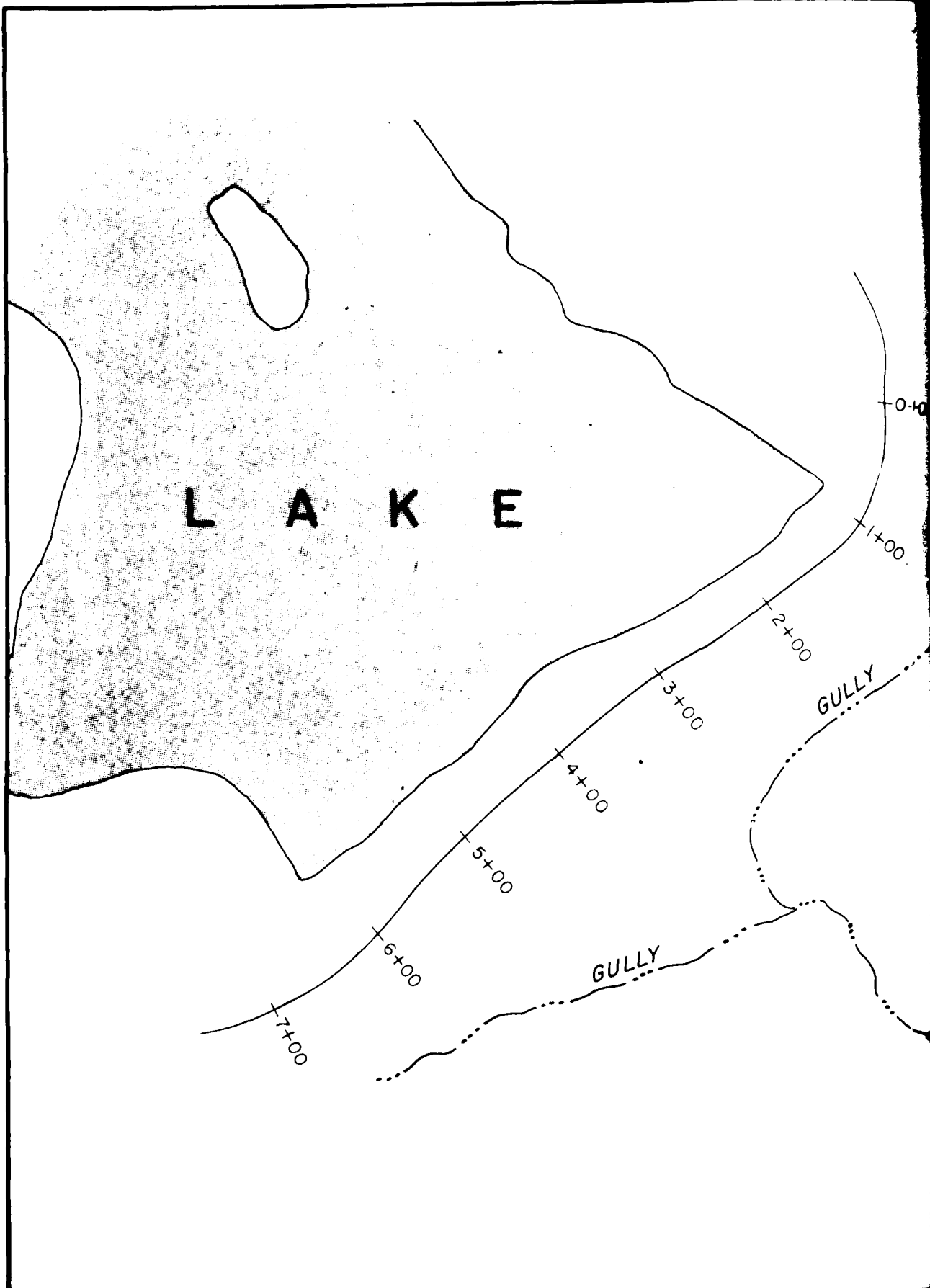


SE 8

SE 5

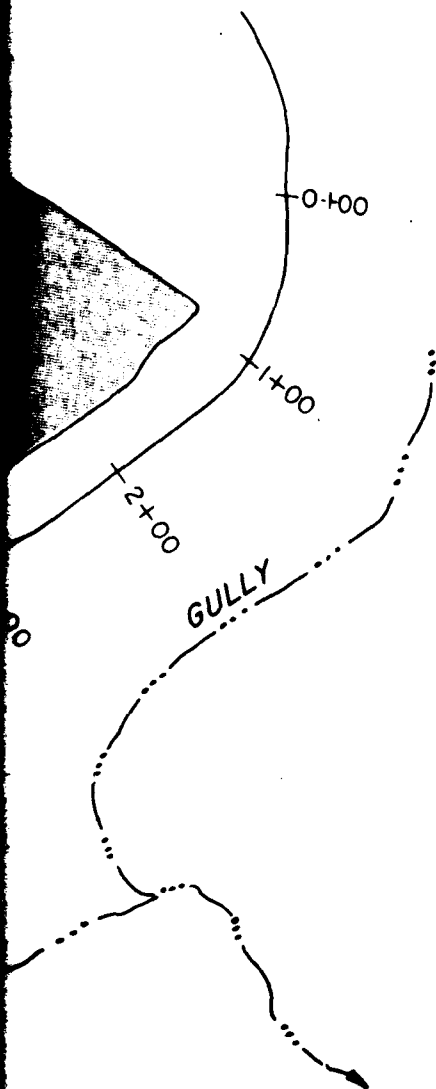


FINAL SURVEY	SURVEYED	BY	DATE
	PLOTTED		
NOTE BOOK	TEMPLATE		
NO	AREAS		
	AREAS CHECKED		



PLAN OF DAM





300 FT.



10,



PLAN OF LAKE

0 100 200 400 FT.





WATERSHED AND OUTFLO





ORIGINAL	BY	DATE
SURVEY		
PLOTTED		
TEMPLATE		
NOTE BOOK	AREAS	AREAS CHECKED
NO.		

[illegible]

120

100

WATER
LEVEL

80

60

0

120

100

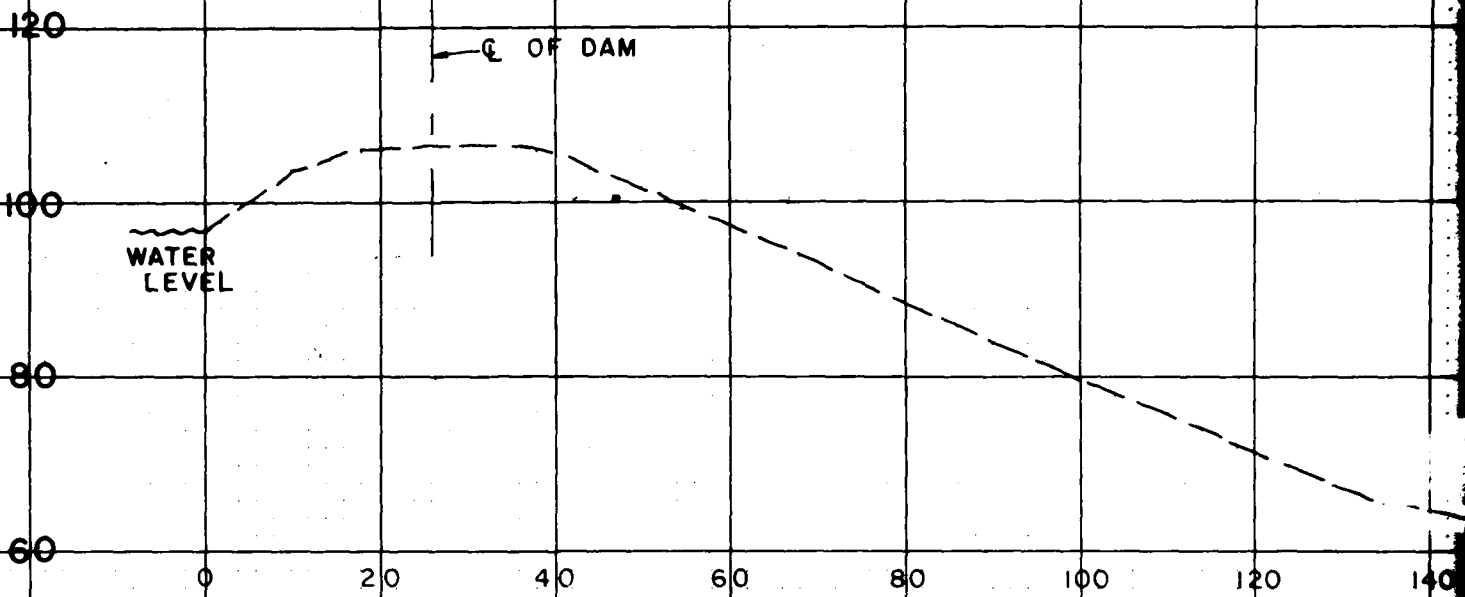
WATER
LEVEL

80

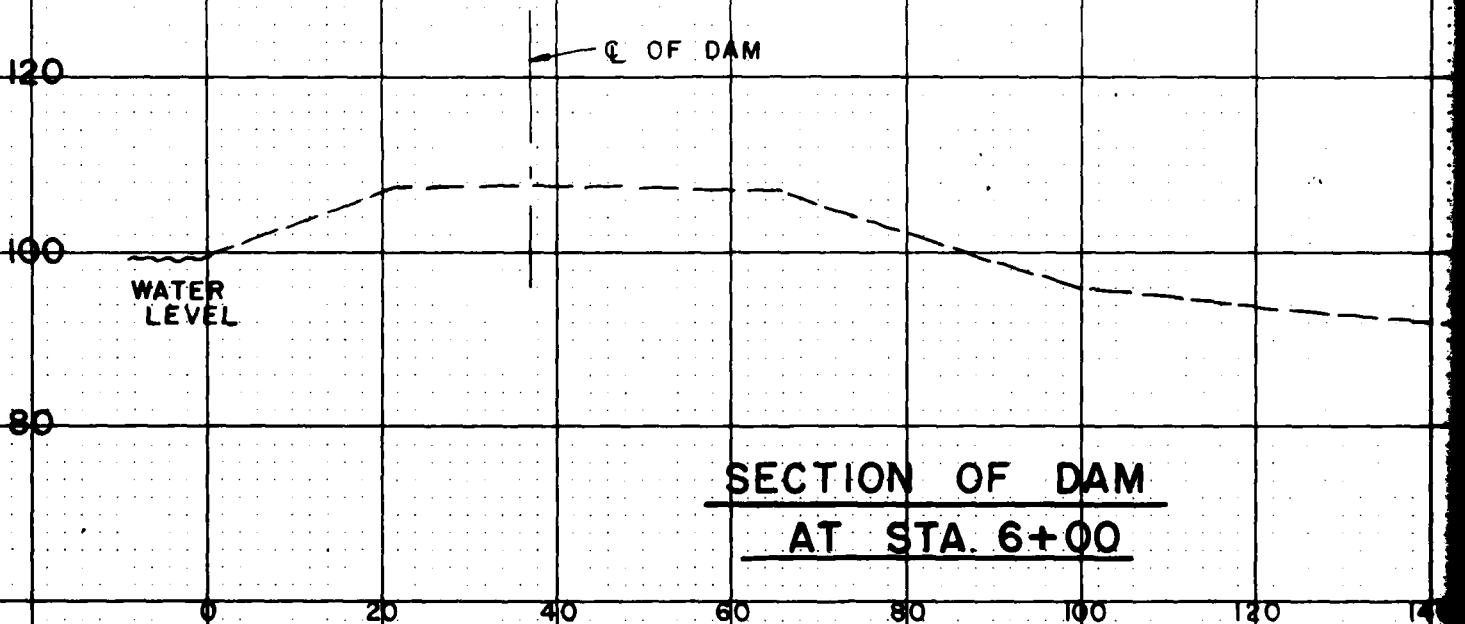
0

12

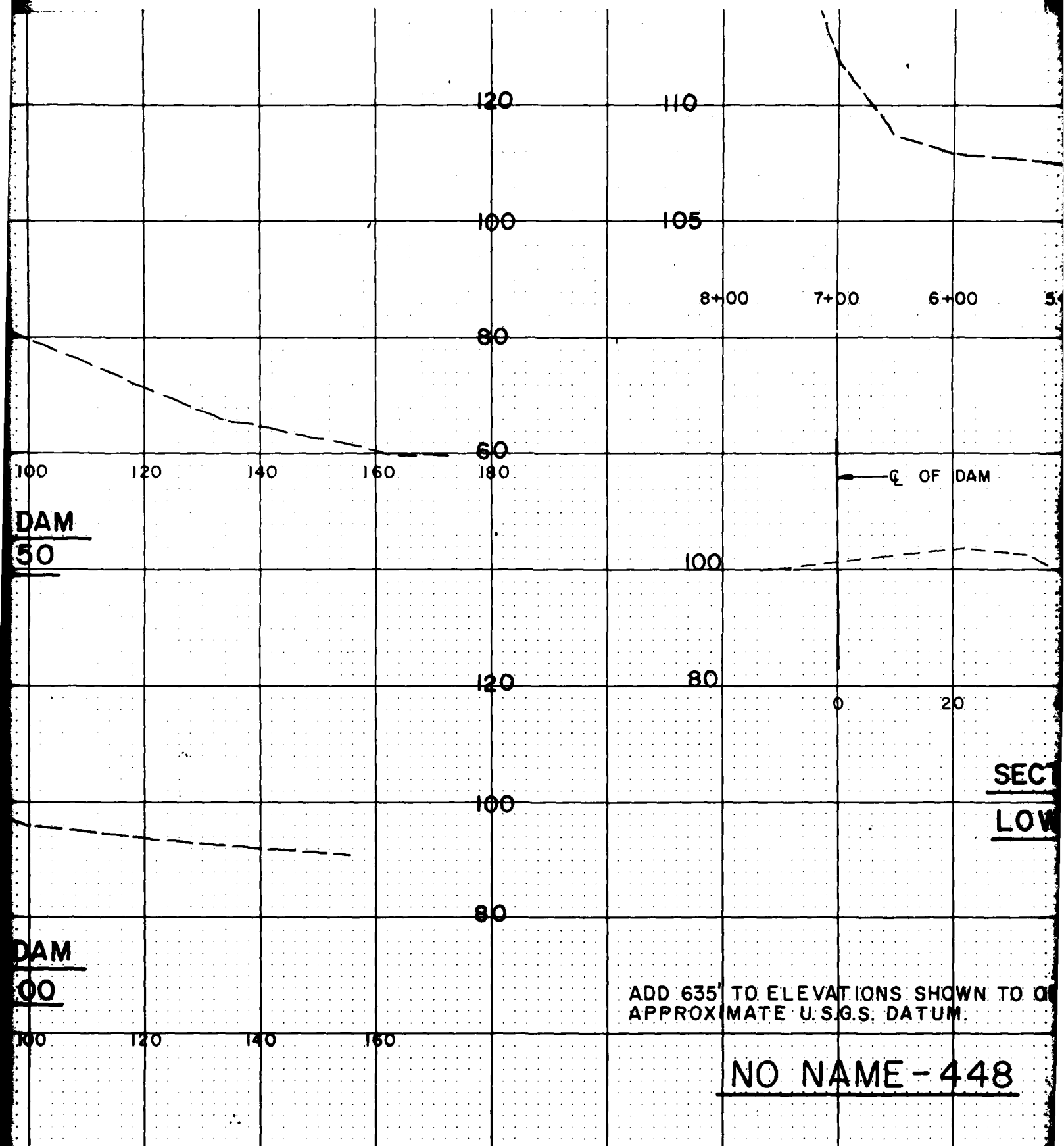
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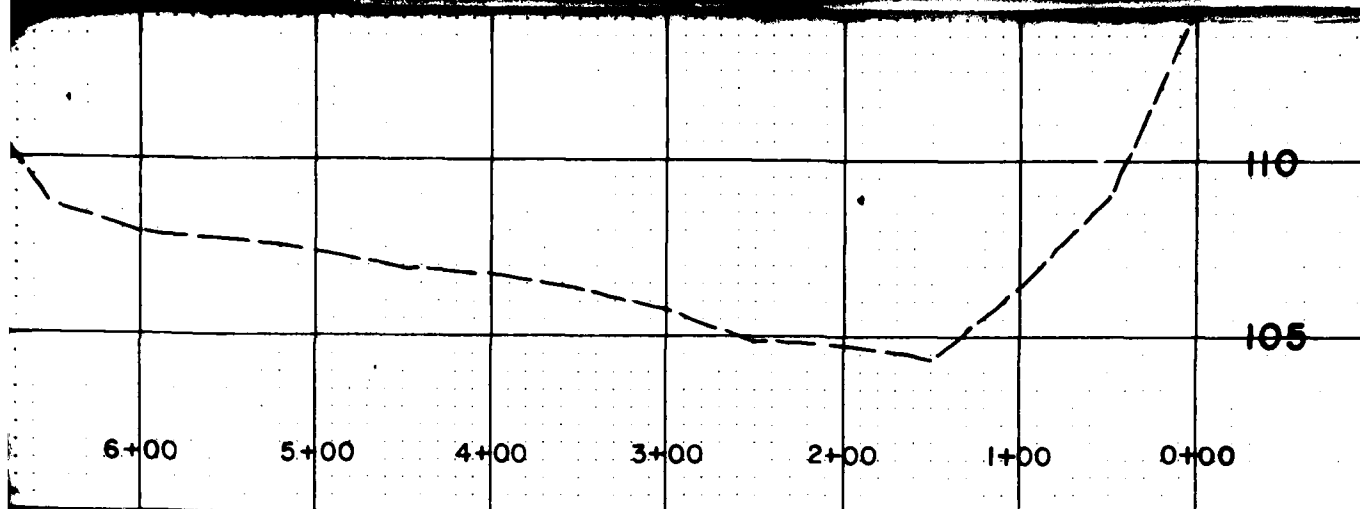


SECTION OF DAM
AT STA. 3+50



SECTION OF DAM
AT STA. 6+00

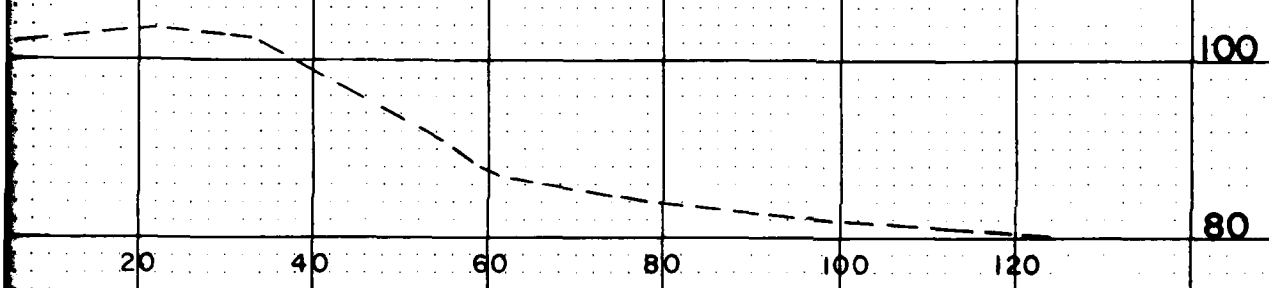




**PROFILE OF
TOP OF DAM**

SCALES
1" = 5' VERT.
1" = 100' HORIZ.

Q OF DAM



**SECTION OF DAM AT
LOW POINT OF CREST
STA. 1+50**

MS SHOWN TO OBTAIN
DATUM.

E-448

PHASE I - INSPECTION
COUNTY I.D. NO. 183
ST. CHARLES COUNTY, MISSOURI

INVENTORY NO. I. D. 30606

FOR ST. LOUIS DISTRICT, CORPS OF ENGINEERS
REITZ & JENS, INC.
CONSULTING ENGINEERS
ST. LOUIS, MISSOURI
SEPTEMBER 1978

15

PLATE 3

DA
FILM
1